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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 902

ALUMINIUM OXIDE PRIMARILY USED
FOR THE PRODUCTION OF ALUMINIUM

MEASUREMENT OF THE ANGLE OF REPOSE

1st EDITION

December 1968

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BRIEF HISTORY

The ISO Recommendation R 902, *Aluminium oxide primarily used for the production of aluminium – Measurement of the angle of repose*, was drawn up by Technical Committee ISO/TC 47, *Chemistry*, the Secretariat of which is held by the Ente Nazionale Italiano di Unificazione (UNI).

Work on this question by the Technical Committee began in 1962 and led, in 1966, to the adoption of a Draft ISO Recommendation.

In May 1967, this Draft ISO Recommendation (No. 1172) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Austria	Israel	Spain
Belgium	Italy	Sweden
Bulgaria	Japan	Switzerland
Canada	Korea, Rep. of	Thailand
Czechoslovakia	Netherlands	Turkey
France	New Zealand	U.A.R.
Germany	Norway	United Kingdom
Hungary	Poland	U.S.A.
India	Portugal	U.S.S.R.
Iran	Romania	Yugoslavia
Ireland	South Africa, Rep. of	

No Member Body opposed the approval of the Draft.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in December 1968, to accept it as an ISO RECOMMENDATION.

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ALUMINIUM OXIDE PRIMARILY USED
FOR THE PRODUCTION OF ALUMINIUM
MEASUREMENT OF THE ANGLE OF REPOSE

1. SCOPE

This ISO Recommendation describes a conventional method for the measurement of the angle of repose of aluminium oxide primarily used for the production of aluminium.

2. PRINCIPLE

Measurement of the angle at the base of the cone of aluminium oxide obtained by allowing a sample to fall through a fixed distance from a defined funnel onto a horizontal base plate.

3. APPARATUS

Only the dimensions given in the text are mandatory.

The apparatus (see Figure) consists of the following items :

- 3.1 *Funnel*, of stainless steel, with an internal diameter of the nozzle of 6 mm, fitted with a sieve of 1 mm aperture mesh held in position between two retaining plates. The funnel is screwed into its support.
- 3.2 *Base plate*, minimum size 270 mm long by 200 mm wide. It should be perfectly rigid and made of marble, stainless steel or other corrosion resistant metal. On the polished surface of the base plate four straight lines are engraved at angles of 45° to each other; at their intersection is a locating pin to which the height block (3.4) can be fixed. It is provided with three adjustable levelling feet.
- 3.3 *Funnel support*, made in stainless steel and of substantial construction. It is designed so that the axis of the funnel is vertically over the central locating pin.
- 3.4 *Height block*, consisting of a metal cylinder with polished faces and 40.0 mm high. The base has a recess to engage the central locating pin of the base plate.

4. PROCEDURE

4.1 Sample

Crude sample*, at a temperature of 22 ± 4 °C.

4.2 Determination

4.2.1 Level the base plate (3.2) by means of the adjustable feet.

4.2.2 Put the height block (3.4) in position and adjust the funnel (3.1) until the nozzle is just in contact with the block. Secure the funnel in position and remove the height block.

4.2.3 Feed the aluminium oxide to the centre of the funnel (3.1) from a height of about 40 mm, taking care not to vibrate the apparatus. Adjust the powder flow to between 20 and 60 g/min.

If the sieve is clogged, use a brush to clear it, taking care not to vibrate the apparatus. When the top of the cone reaches the nozzle of the funnel cease feeding the aluminium oxide.

Using a pencil, mark the circumference of the base of the cone on the eight radii engraved on the base plate.

Remove the aluminium oxide and measure the four marked diameters.

5. EXPRESSION OF RESULTS

The angle of repose, expressed in degrees, is given by the following formula :

$$\text{Arctg } \frac{2H}{D - d}$$

where

H is the height of the cone, that is the distance between the base plate and the nozzle of the funnel,

D is the arithmetic mean of the four diameters measured according to clause 4.2.3,

d is the internal diameter of the nozzle of the funnel.

Using the apparatus described in section 3 the formula for the calculation of the angle of repose becomes

$$\text{Arctg } \frac{80}{D - 6}$$

6. TEST REPORT

Give the following particulars :

- (a) the reference of the method used,
- (b) the results and the method of expression used,
- (c) any unusual features noted during the determination,
- (d) any operation not included in this ISO Recommendation or regarded as optional.

* See ISO Recommendation R 802, *Aluminium oxide primarily used for the production of aluminium – Preparation and storage of test samples*, clause 2.2.